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ABSTRACT

Although accountants have used computers for tax planning and tax return preparation for many years, tax education has been slow to reflect the increasing role of computers in tax accounting. The following are only some of the tasks that a business education department offering undergraduate tax courses for accounting majors should perform when developing a program to train accounting majors in the use of microcomputers: evaluate available tax software for educational purposes; identify the material in undergraduate tax courses that is suitable for presentation in electronic data processing format; develop instructional procedures for computer assignments; prepare sample cases and assignments that can be used for computer instruction in taxation, and develop testing strategies to evaluate student progress in computer use. The scope of these tasks might cover both tax planning and reporting functions for individual, corporate, S-corporation, partnership, trust, and estate income taxes and for transfer (estate and gift) taxes. Microcomputers can also make it possible to shift the emphasis of tax accounting courses away from tax compliance rules to tax planning (so as to minimize the amount of taxes due). Toward this end, instructors can place more emphasis on tax algorithms and tax planning problems. Computer problems might involve both discovery learning exercises (in which students write programs and/or spreadsheets) and tax computations for comprehensive tax return and planning problems. Failure to use microcomputers in undergraduate courses is a genuine disservice to students inasmuch as many of them will soon be expected to work in an environment in which computer skills are indispensable. (MN)

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INTRODUCING THE MICROCOMPUTER INTO UNDERGRADUATE TAX COURSES

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INTRODUCING THE MICROCOMPUTER INTO UNDERGRADUATE TAX COURSES

ABSTRACT: Certain tasks related to the use of computers in an undergraduate tax course are explored. These include the evaluation of software, identification of suitable material, development of instructional procedures, preparation of cases, and evaluation of student progress. The author's experience in these tasks is shared, and suggestions of a how-to-begin nature are offered.

INTRODUCING THE MICROCOMPUTER INTO UNDERGRADUATE TAX COURSES

INTRODUCTION

Computers have been utilized for many years for tax planning and for tax return preparation, but tax education has been slow to reflect this state of affairs. Perhaps in recognition of this and other trends, the AACSB has stated in its interpretations of standards for accounting programs that students are expected to use the computer in accounting courses [AACSB, 1984-85, p. 44]. This standard is not being met. A recent survey by Duangploy and Melcher [1984, p. 34] reveals that currently, in undergraduate tax courses, hands on computer applications are not used in 90 percent of the responding accounting programs. Thomas [1984, p.33] found that 69 percent of responding accounting departments surveyed were not using microcomputers in teaching any accounting courses.

What tasks need to be accomplished before computers can be integrated meaningfully into an undergraduate tax course? The following is a partial list which should be appropriate for a department offering two undergraduate tax courses for accounting majors (individual income taxes and taxation of corporations, partnerships, estates, and trusts):

(1) Evaluation of available tax software for educational purposes,

(2) Identification of material in undergraduate tax courses which is suitable for presentation, in EDP format,

(3) Development of instructional procedures for computer assignments,

(4) Preparation of sample cases and assignments which can be used for computer instruction in taxation, and

(5) Development of testing strategies to evaluate student progress in computer utilization.

The scope of these tasks might cover both tax planning and reporting functions for each of the following: individual income taxes, corporate income taxes, S-corporation income taxes, partnership income taxes, trust

income taxes, estate income taxes, and transfer (estate and gift) taxes. The foregoing represent the major practice-oriented computer applications in most undergraduate tax courses. Purely teaching-oriented tasks may also be implemented.

The computer may cause major changes in how taxation is taught to accountants. The trend could be away from stressing an understanding and mastery of tax compliance rules toward greater emphasis on planning to minimize taxes--evaluation of alternative strategies in both personal and business settings. The computer will enable tax instruction to emphasize the whole (the tax liability) as opposed to the parts (specific detailed rules). It is certainly not too early to plan for the computer's implementation, especially if it makes tax education more meaningful and interesting to students.

EVALUATION OF SOFTWARE

Evaluating software is a complex task. Certainly, one cannot evaluate software without having a minimum amount of experience using such software. Instructors of tax courses seeking experience might attend the annual American Taxation Association computer usage conference [Accounting Education News, 1986, p. 5]. This conference should enable the participant to obtain some informed advice about available software. There is also an ongoing Arthur Young Foundation funded research project that should be very helpful to tax researchers. It is titled "Microcomputers in Tax Education--Optimal Strategies" and is being undertaken by Professors Janis R. Reeder and John W. Wragge of the University of Delaware. The project's objectives are: (1) to identify the factors to consider regarding the use of microcomputers in tax classes, (2) to compile a directory of current usage of microcomputers in tax classes, and (3) to prepare a listing of tax software available to tax faculty members [ATA Newsletter, 1984a, p. 2]. Also, the ATA has a Computer

Usage Committee (1984-85) which is charged with developing a descriptive list of software available to tax professors for classroom use and to indicate in which courses each of the software can be used [ATA Newsletter, 1984b, p. 4]. This committee's report will be published in the Spring 1987 issue of The Journal of the AMerican Taxation Association. Some useful evaluation criteria are offered by Raabe et al., [1985, p. 93] for tax software. In the end, however, the evaluation will have to be carried out personally by the instructor. Of course, an instructor expert in computer applications always has the option of developing software where none is available from other sources. Incidentally, the sources of software are not limited to commercial textbook publishers and vendors of educational materials. Many large CPA firms, for example, have their own tax planning packages, which may be made available to educators at no cost if certain conditions and security arrangements are met. These packages typically cover the areas of individual taxation, corporate taxation, and family financial planning.

IDENTIFYING MATERIAL SUITABLE FOR COMPUTER APPLICATION

Stone [1974, p. 291] lists the following ways in which computers may be used in accounting education:

1. Canned programs,
2. Computerized cases and practice sets,
3. Games and simulated environments,
4. Computer-aided instruction,
5. Data-based systems,
6. Student developed programs.

Four of these (1, 2, 3, and 6) provide excellent opportunities to use computers in undergraduate tax courses. The other two (4 and 5) might be appropriate for a programmed-instruction course in taxation and for graduate research courses, respectively.

Canned Programs

The simplest way to introduce computers into a tax course is probably with a canned program. These are preprogrammed packages designed to perform specific analytical or computational tasks. A typical example would be a program to compute an individual's tax liability. Canned programs for student use are often user friendly and enable the student to solve realistically difficult, data-rich problems [Stone, 1974, p. 292]. An example of a canned program is Tax Comp II [Stern, 1986] which allows students to complete LOTUS template exercises for certain corporate and partnership problems.

Computerized Cases and Practice Sets

Closely related to canned programs are computerized cases and practice sets. These are usually offered as supplements to traditional texts by textbook publishers. Unlike canned programs, computerized cases and practice sets are specifically designed as teaching aids, with diagnostic feedback and a focus on conceptual understanding. Their adoption and use often require minimal computer expertise. Ideally, such materials are class-tested, well documented, and not married to any particular text.

Some caution should be used when canned programs or computerized cases and practice sets are employed. Stone [1974, p. 293] claims that many merely replace pencil-pushing with key punching, creating a false impression of computer skills. Ijiri [1983, p. 172] argues that some pencil-pushing is absolutely essential in learning accounting, since excessive reliance on personal computers will rob students of their mental ability in many phases

of accounting. He suggests that the difference between accountants and para-accountants might otherwise disappear. It is the authors' opinion that canned tax calculation programs should be used along with manual calculation of taxes and not to take the place of all manual calculations.

Business Games

Business games with computer simulated environments are widely used in management and marketing courses--especially at the graduate level. An example of an undergraduate game is Business Policy Simulation [Loveland et al., 1979]. Games such as this provide students with formulas, sample decisions, rules, objectives, and beginning positions. They seek optimal solutions within the simulated environment, management objectives, and management policies. The obvious area in taxation where a game could be used is tax planning. Many tax computation packages allow for three to five alternatives (either different fact situations within one year or over a number of years) and can be used for tax planning. Our experiences will be discussed later. The instructor must provide information about the simulated environment and details about the current position of the taxpayer and the taxpayer's objectives and policies. A tax planning game is an intriguing prospect, but the time constraints in undergraduate tax courses are a barrier.

Computer-Aided Instruction and Data-Based Systems

Computer aided instruction and data-based systems are probably inapplicable to a discussion where the emphasis is on conventional one-semester undergraduate courses offered in a classroom setting. However, it should be noted that computer-aided instructional techniques, which have been experimented with widely for elementary accounting courses, might have

potential for a course in individual income taxes since this course also includes a large number of short steps or procedures which the student should be led through.

For research in taxation, there is now available the Arthur Young Tax Research Data Base at the Paton Accounting Center at the University of Michigan which includes IRS developed random samples of Form 1040 and 1040A returns filed for 1979 and some later years. This data base is very useful for evaluating tax policy questions. These are most often dealt with at the graduate level. However, one might wish to add interest to undergraduate courses during the current period of assimilation of tax reform by evaluating the revenue effects of the new law with the data base.

Student-developed programs may become quite widespread in the teaching of accounting, and particularly, undergraduate tax courses if an algorithm-based approach is adopted for teaching in these courses. This teaching approach, and the advantages of requiring student-developed programs, is addressed in the next section.

DEVELOPMENT OF INSTRUCTIONAL PROCEDURES FOR COMPUTER ASSIGNMENTS

Algorithms have been used implicitly by accounting instructors for quite some time. Their usage is nurtured by the illustrative (problem-solving) teaching approach. When the student is able to identify, inductively, the algorithm demonstrated through the problem material, additional problems may be solved with relative ease [Umapathy, 1984, p. 137]. Making the algorithm explicit, whether in the form of a decision-tree, flowchart, formulated worksheet, or computer program, should give the student a faster understanding without necessarily reducing the quantity of topics covered or the depth of the coverage. Umapathy [1984, p. 137] suggests students can learn to use an algorithm with negligible external assistance if check figures for critical steps in solving a problem are also provided.

There have been some examples of tax algorithms for educational purposes in the accounting literature with the emphasis on corporate tax issues. Some of these are flowcharts for determining corporate earnings and profits [Pope, 1979, p. 163], decision tables for determining corporate liquidation tax consequences [Gately, 1984, p. 68], and tables showing corporate distribution effects [Dillaway, 1984, p. 111].

An example of a simple tax algorithm in statement form follows. The example is based upon the special credit available to certain married, head of household, and surviving spouse individuals. The earned income credit for 1987 is available to qualifying individuals with either earned income or adjusted gross income of less than $14,500 ($17,000 for 1988 and later years). The amount of the credit is 14 percent of earned income up to a maximum of $5,714 reduced by 10 percent of the excess of the smaller of earned inocme or adjusted gross income over $6,500 ($9,000 for 1988 and later years). For example, a qualifying individual with $12,000 of wages and $300 of interest income for 1987 would be entitled to an earned income tax credit of $250 [.14 x $5,714 - .10 x ($12,000 - 6,500)].

Teaching with explicit algorithms may take two forms: reception learning of generalized algorithms and computer-assisted discovery learning of accounting algorithms [Bentz, 1974, p. 215]. Bentz [1974, p. 216] cautions that with the reception learning method, where algorithms are presented in a general form and then applied to a series of problems, (1) students are not required to think about the algorithm, (2) students may wind up with only a preverbal understanding of the algorithm, and (3) students may not be as motivated as they would be if challenged with a puzzle to solve. Discovery learning of accounting algorithms, however, has as its goal (student) construction of an algorithm to solve problems of the type being studied [Bentz 1974, p. 217]. The algorithm may be specified in many forms, including computer programs. Bentz [1974, p. 217] argues that some of the

benefits of discovery learning, from an instructional standpoint, are (1) better motivation due to feedback in the algorithm construction stage, (2) inherent satisfaction in the task itself, and (3) better understanding of the accounting procedure due to the higher level of abstraction necessary to produce the algorithm.

Student-developed programs are a natural choice in the individual tax course where discovery learning of accounting algorithms is specified. For instance, an instructor might assign his students the task of writing a program to show the maximum annual writeoff in each year of the life of a new piece of five-year ACRS property, acquired in 1987, to include each of the following: availability or not of the Sec. 179 expense, use of statutory percent or straight line method, and use of extended life options with the straight line method. Additional algorithms which might be assigned to the student to develop would be passive income loss carryover and the alternative minimum tax. These are complex to the degree that reception learning techniques might not give the student an understanding of the explicit algorithm. Furthermore, the types of assignments which involve programming are limited by the students' programming ability and the time available for this type of activity.

Assignments for student-developed programs might follow the example just discussed for comparing maximum annual writeoffs for five-year ACRS property. The program language could depend upon the students' education. It is desirable if most students in an undergraduate tax course have previously studied BASIC, COBOL, or FORTRAN in addition to a spreadsheet program. Other tax topics that could be taught by having students write a program based on an algorithm are: amount of IRA deduction, alternative minimum tax, child

care credit, installment sales income, Sec. 1250 recapture, charitable contributions amounts before limitation, and cost of sales under dollar value LIFO, to name just a few possibilities.

PREPARATION OF SAMPLE CASES AND ASSIGNMENTS

Sample cases for classroom use would most likely be tax return problems, simple one or two issue planning problems, or longer, more complex ones; for example, on family financial planning. Outslay et al., [1983, p. 431] suggest a framework for preparing tax compliance problems. We have prepared examples of both tax compliance and tax planning cases to be solved using any tax computation or tax planning software for individuals (Appendices I and II). The objective of these is to give the student some realistic experience of how computers are used in tax practice.

The compliance case, "Jim and Sue Adams" (Appendix I), consists of a set of instructions and a fact situation. The complexity of the case can be increased significantly, or decreased, by adding or removing transactions. As it stands, it should be used after students have covered inclusions and exclusions, itemized deductions, cost recovery, and have had at least an introduction to capital gains and losses. Virtually all of the questions involved can be answered from one of the standard textbooks for a first tax course. If the instructor wishes to have students carry out research in a tax service or other source, certain of the transactions can be made more complex or other transactions can be included. Where this case is used as the first one in the course, the authors prefer to limit the research to text materials.

If the students have had little or no experience with microcomputers, they might be asked to complete the cases <u>first</u> on the tax forms and then to <u>verify</u> their result on the computer. This eases their introduction to the computer somewhat and lets them concentrate on one thing at a time, i.e.,

applying the tax rules to the case situations first and then performing the computer input chore. Students who already have experience on the microcomputer can be asked to work the case on the computer first and then transfer the results to the tax forms. The authors feel that all first tax course students should have some hands-on experience with tax forms; however, if several computer case problems are used during the semester, some can be solved only on the computer to illustrate certain complex tax rules (e.g., the alternative minimum tax) and/or to demonstrate the capabilities of the software.

Tax planning is a process of identifying alternatives, identifying the appropriate tax rules for each alternative and then evaluating the alternatives. The process remains the same, regardless of whether it is done manually or by computer; however, the computer's value in tax planning comes from the speed with which it helps to evaluate the alternatives. Even solving the rather simple case problem prepared by the authors, "Ima Tax Planner," which involves essentially only two issues--whether to take the IRA deduction and whether to invest in tax exempt securities--can become burdensome if done manually.

At New Mexico State University we have used case problems such as Ima Tax Planner in the first tax course which typically consists of two sections of 30-40 students each. The software used is the individual tax calculation package of a major CPA firm, which is used as a template on Lotus 1-2-3. The spreadsheet allows five alternatives which may either be used for five different fact situations within one year or for five different years. The software incorporates known changes to the tax laws of future years; otherwise, the assumption is that tax laws are the same as the current year.

Longer, more complex cases on family financial planning are being used in a graduate course on estate and gift taxation (10-15 students). The software, Aardvark-McGraw Hill's Estate Planner, is reasonably versatile and

well documented. Aardvark-McGraw Hill offers (at this writing) a discount to educational institutions on this software. Given the speed with which students can make estate tax calculations on the computer, it is reasonable to use more complex and realistic cases and to expect more complete results.

Tax students at New Mexico State University do their work on the cases in a computer lab situated in the College of Business which houses some fifty IBM Personal Computers. Printers are available in the lab. Student lab consultants are available during all open hours, which during the long term are about fourteen hours on weekdays and eight hours per day on weekends. Tight security is maintained in the lab on both hardware and software.

Our experience with the use of both short and long case problems in the classroom has been good in terms of logistics and student acceptance and enthusiasm. However, there is not sufficient evidence yet to say whether students are learning tax material better or more rapidly because of the use of computer assignments. The use of more realistic assignments because of the reduced time spent on calculations in planning exercises is a plus. Incorporating computer assignments in courses has not cut down on the quantity or breadth of material covered nor has it replaced the majority of the hand-calculated problem materials.

Case problems of this type are very useful in teaching the student to identify all of the alternatives and to understand the interrelationship between certain tax provisions. In addition, the student quickly learns to appreciate the capabilities of the computer and the software as the computational burden is reduced.

DEVELOPING TESTING STRATEGIES

Developing testing strategies is, perhaps, the least explored part of integrating computers into undergraduate tax courses. What we are addressing here is not administering tests to students on a keyboard, per se,

but testing whether they have been able to master the desired tax-related computer applications. Two basic areas need to be covered in the testing. First, where computer-assisted discovery learning of algorithms was involved in the coursework, a computer program for applying a tax algorithm resulted. The logical testing procedure would be to require the writing of a similar or related program on a test. In the ideal situation, this would be at the keyboard of a microcomputer in a timed exercise, where the student could have the benefit of diagnostic feedback. Testing of these skills could also be under untimed conditions in a proctored computer lab, with both a program and printed result for exercises required to be submitted. The least desirable method of testing would be having the student write and submit a program for an algorithm in a conventional classroom test, without the aid of a computer. This might lead to memorization at the expense of hands-on experience.

The second area of mastery of computer skills would be the use of canned programs; in this case, tax planning or computation packages. Due to the length of most comprehensive tax problems and the need for references, these skills are probably not easily tested in a conventional timed test, where about all one could do would be to determine the student's familiarity with the software instructions. However, a key item that is part of the instructions--how to combine items upon input--is critical to the student's understanding of taxation. This knowledge is easily tested in a conventional test format by several types of test items.

Testing in a course in income taxation should necessarily be concentrated on an understanding of the tax law and its practical applications in tax planning and compliance. Computers aid the practitioner in these situations primarily by doing complex computations and by holding in memory bulky data bases. The authors have concluded that mastery of these

applications can be adequately demonstrated by students by turning in printouts of computer assignments. As yet, we have not required program writing or keyboard work on any of our tests.

SUMMARY

Introducing microcomputers into undergraduate tax courses is a task that merits serious consideration. Such integration cannot be accomplished without restructuring courses, in most cases. Typically, instructors simply cannot add more topics and assignments. It is suggested here that tax course assignments emphasize tax algorithms and tax planning problems. Computer assignments might involve both discovery learning exercises, where the student writes a program and/or spreadsheet, and tax computations for comprehensive tax return or planning problems. Failure to use microcomputers in the undergraduate courses is a genuine disservice to students, many of whom will soon be expected to perform in an environment where such skill is indispensable.

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APPENDIX I

Jim and Sue Adams
First Tax Return - Spring, 1987

INSTRUCTIONS:

1. Complete the return on the 1986 forms handed out. After completing the return, verify the results by using the 1040 computer software. If you want to use scratch copies to work the return on, you can xerox the forms. The copy that you turn in should be printed in ink or typed (printing is faster) and should be complete, in good form, and neat. Do not write over a pencil copy in ink - writeovers are not acceptable.
2. The due date is April 2, 1987 at class time. Late returns will be penalized 15 points per day (or fraction of a day). Turn in the completed return and the computer printout (Main Report only).
3. You should have sufficient information to complete all aspects of the return. If you feel that you must make assumptions, list your assumptions on a separate sheet of paper and hand it in with the return. Beware, however, do not use assumptions to substitute for good analysis or tax research.
4. Answer all relevant questions on the return, even if you have to make up answers. Complete the preparer's declaration on page 2, Form 1040 with assumed information, treating yourself as preparer.
5. Your name and seat number should be placed in the upper-right-hand corner of the front page of Form 1040. Staple the return in the upper-left-hand corner and affix the computer run with a paper clip
6. Use whole dollars only - round where necessary. Zeros are not necessary where no amount is needed on a line.

FACT SITUATION:

Jim and Sue Adams, both 27, are married with one dependent child, John. They live at 1105 Green Street, Urbana, IL 61801. The Adams' file a joint return and their Social Security numbers are 060-92-3456 (Jim) and 123-67-0456 (Sue). Sue is a secretary at Widget Works, Inc. and Jim is an account manager at ABC Trucking Co. Both Jim and Sue elect to contribute $1 to the presidential election campaign. They had the following receipts in 1986:

(1)	Jim's salary from ABC Trucking Co.	$20,000
(2)	Sue's salary from Widget Works, Inc.	15,000
(3)	Dividends on General Motors stock owned by Jim.	200
(4)	Reimbursement of 1986 medical bills by insurance company.	1,600
(5)	Expense allowance from ABC Trucking Co. to cover business expenses incurred by Jim.	750
(6)	Selling price of a parcel of land they had held since June 12, 1981 as an investment (basis was $5,000). Date of sale was April 2, 1986.	7,000
(7)	Reimbursement by ABC Trucking Co. of dues in a professional organization related to Jim's work.	150
(8)	Dividends received on IBM stock owned by Sue before marriage (Illinois is a common law state).	200
(9)	Dividends on Exxon stock (jointly held).	100
(10)	Interest on Acme Corporation coupon bonds owned by Sue's father, who clipped the coupons shortly before the interest payment date and gave them to Sue.	500

(11)	Payment to Jim by insurance company of disability benefits under a medical and disability insurance policy; Jim, who was injured and unable to work for four weeks, had acquired the policy and paid the premiums on it.	800

Jim and Sue had receipts and other documentary evidence for the following disbursements made in 1986:

(12)	Business expenses incurred by Jim [see (5) for reimbursement information] included business travel, $600, and business entertainment, $400.	$ 1,000
(13)	Contribution to United Way.	520
(14)	Premiums for health insurance coverage.	400
(15)	Presciption drugs and medicines.	420
(16)	Nonprescription drugs and medicines.	60
(17)	Doctor bills.	800
(18)	Hospital bills.	2,200
(19)	Contact lenses for Sue.	150
(20)	Interest on home mortgage (paid to First National Bank).	3,000
(21)	Interest on credit card accounts.	120
(22)	Real property taxes on their residence.	729
(23)	State sales tax on new automobile purchased in December, 1986.	325
(24)	State income tax paid in April 1986 when they filed their state income tax return for 1985.	70
(25)	Fee for preparation of 1985 tax returns.	100
(26)	Professional dues and subscriptions for Sue.	85

Jim's personal automobile was totaled in November 1986 when it caught fire because of a leak in the fuel line. Jim had paid $2,200 for the auto two years ago. Its fair market value on the date of the fire was $1,400. Jim carried only liability insurance on the auto and received no reimbursement from his insurance company. He sold the auto to a salvage company for $500.

Federal income tax withheld by their employers totaled $3,733 ($2,060 for Jim, $1,673 for Sue), and state income tax withheld totaled $700 ($420 for Jim, $280 for Sue). Estimated Federal tax payments were $400. They are entitled to a political contributions credit of $100.

Assume Jim does not render an adequate accounting to his employer but has the records necessary to substantiate employee expenses. Reimbursements received by Jim from his employer [see items (5) and (7)] were not reported on his W-2 form. You will need Forms 1040 and 2106 and Schedules A, B, D and W.

APPENDIX II

IMA TAX PLANNER

You are a single taxpayer, age 40 as of 1-1-87, with extended earnings and cost outlooks as follows:

	Salary	IRA Earnings or Interest on Savings	Living Expenses
1987	$20,000	7-1/2%	$19,000
1988	$23,000	8%	22,000
1989	$25,000	7%	23,000
1990	$29,000	6-1/2%	25,500
1991	$31,000	7%	27,000
1992 to 6	$34,000	8-1/2%	31,000

Assume that when you need more funds, these can be borrowed at an interest rate equal to your savings rate plus one percent. Determine the accumulated amount available to you as of 1-1-98 on an after-tax and penalty basis if you (a) contribute the maximum to an IRA with the rest to savings, (b) contribute only to a conventional savings account, or (c) buy only tax-exempt bonds with your excess fund paying 6 percent interest. Assume that you will make end of year contributions to savings or IRA and that taxes on everything except investments are included in the living expenses.